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AUTHOR Davis, James E.; Haas, John D.
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ABSTRACT

A discussion of microcomputer applications in elementary and secondary school social studies is accompanied by a list of publications and a checklist to aid educators in evaluating programs for microcomputers. Six instructional uses of the microcomputer are drill and practice, tutorial, demonstration, simulation, instructional games, and computer literacy. Drill and practice and tutorials represent the most simple type of computer use. In creating a demonstration, the computer illustrates processes and systems; however, demonstration programs for the social studies are relatively rare. Simulation and instructional games are popular with social studies teachers and students and many computer programs are available. A drawback is that the machine-student interactions restrict, if not preclude, interaction among students. Using computers to become computer literate involves running commercially produced programs, creating programs, modifying existing programs, using computers to retrieve information and solve problems, evaluating a program, and understanding computer technology as a source of social issues. Eight appendices include the following: a glossary; lists of microcomputers used in schools, useful books, sources of information for educational software, periodicals, and general computing magazines; a 2-page software evaluation checklist that covers initial information, instructions, input, and overall impression; and a transcribed interview with a school district computer education coordinator. (KC)

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MICROCOMPUTERS IN THE SOCIAL STUDIES

By James E. Davis and John D. Haas

Davis is Associate Director of the Social Science Education Consortium, Boulder, Colorado

Haas is Professor of Education, University of Colorado, Boulder, Colorado

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A Parable

Once upon a time there was a society. This society transmitted information only by word of mouth. Then one day some enterprising people in the society invented two new ways to transmit information. They called these reading and writing. Some, but not many, people in the society were excited about reading and writing. These were people in government and business who bought the new technology. The sellers of this new technology wanted to expand their markets. So they turned to the schools. The marketers designed a system where professional writers wrote down the words of the teachers. Then trained readers read the writings of the teacher's words to the students. This new system was very cost effective, because it required less time of the teachers.

Soon the teachers began to think, "Why can't we understand this new reading and writing technology?" So the teachers began to teach themselves to read and write. Their reasoning was that reading and writing seemed to be fundamental skills. If reading and writing were fundamental, why not teach students these fundamentals. Just to use reading and writing to transmit information to students (W.A.I. - writing assisted instruction and R.A.I. - reading assisted instruction) was cheating the students out of the opportunity to actually read and write. Happily, the new skills of reading and writing became more accepted in the society. Some school administrators and college professors thought the skills might be useful and began to use them. After a number of years, all the schools in the society had as major goals the teaching of reading and writing.

Can we characterize our current society along the same lines as the parable? We have a society where much information is transmitted by means of the written (and read) word and have had for about 400 years; we also have the medium of television where information is converted to the spoken word and to visual images. Now we are being told we are in the age of computers. Some have called it the age of information. The teachers in our society are asking: "Is computer literacy as fundamental as reading and writing?" "Are we cheating students if we use computers just to transmit information to them?" "What are the uses of the new microcomputers?"

In this paper we present some beginning ideas that will help social studies educators establish at least a speaking acquaintance with some of the thinking in the field of microcomputers and their classroom uses. We

chose the "box" format (appendices at the end) for some of the presentation so that we could pack more helpful information into the paper.

What is a Microcomputer?

Almost all urban and suburban school districts own or lease a computer for central office uses--mainly bookkeeping, records storage, school schedules, and other administrative tasks. In some districts these comparatively large "main-frame" computers are also used for instruction, in which case the programs (i.e., courses, units or lessons) are stored in the central computer (or on easily accessible tapes or punch cards), and teachers and students use remote terminals (electronic keyboards) to gain access to these programs. The remote terminals are connected to the central computer by district-owned cables or by use of local telephone lines. Users of these computers share time on computer circuits in much the same way planes share airport runways for takeoffs and landings. The main-frame computer is designed to handle complex routines for many simultaneous uses at an optimal speed for each user. Smaller versions of main-frame computers are called minicomputers, but even these are too large and expensive (at present) for a single school's uses.

The microcomputer was developed (in the mid-1970s) to meet the needs of individual users who wanted exclusive, "dedicated" use of their own computers, at relatively reasonable costs. This self-contained computer is most appealing to owners of small businesses, to self-employed persons such as doctors, dentists, and writers, and to families and schools--and also, of course, to manufacturers of arcade game machines. In the photograph on the next page, one can view the main components of a microcomputer system: (1) a plastic or metal console with a typewriter keyboard and containing a CPU (Central Processing Unit), ROM (Read Only Memory) chips which are permanent storage for one form of BASIC language, and RAM (Random Access Memory) chips for storing information fed in by the user; (2) a monitor, which is essentially a small television set, for displaying the computer's output; and (3) a disk drive, which accepts diskettes (i.e., "floppy disks," that look like thin, flexible 45 RPM records) that contain data or programs, making a diskette an external memory.

Photo: Apple Computer, Inc.

The proper greeting for a microcomputer is "HELLO," but one's initial contact is like meeting a person for the first time--without anyone to make the introductions. Of course, there are manuals and tutorial booklets to prepare the novice user, yet these do little to alleviate first fears. Practice and trial-and-error efforts soon reward the beginner who stays at it. The chief early rewards are mastery of the keyboard and some basic commands, the ability to use commercial or teacher-created programs on diskettes, and the skills needed to do rudimentary programming in BASIC language.

Microcomputers in the Classroom

The basic questions principals and teachers ask about microcomputers are: (1) What are their present and potential educational uses? (2) What types of programs ("software") are available, at what grade levels, and in what subjects? (3) Has there been any evaluation of the software? (4) What are the costs for the equipment and for commercial programs? (5) What are the classroom logistics and scheduling demands? and (6) What do teachers and students need to know about the microcomputer in order to use it effectively as a classroom learning tool?

A Few of the Answers. There are at least two categories of classroom use of microcomputers: management and record-keeping tasks and instruction. Many routine classroom chores can be completely handled by an in-class computer or can be simplified with the help of a computer. Teachers do quite a bit of record-keeping that could become less burdensome with the aid of a microcomputer: maintaining class rosters; checking textbooks out to and back from individual students; recording and reporting student attendance; recording completion and grading of homework assignments; recording results of quizzes, tests, and examinations; analysis of scores in determining letter grades; creating and producing ditto masters; and other information processing required by district and school policies.

There are six general uses of microcomputers as aids to teaching and learning. These are: (1) Drill and Practice, (2) Tutorial, (3) Demonstration, (4) Simulation, (5) Instructional Games, and (6) Computer Literacy Skills.*

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*One treatment of microcomputers in social studies is: Ronald Salzinski, "Microcomputers in Social Studies: An Innovative Technology for Instruction," Educational Technology, Vol. 21, No. 1 (Jan. 1981).

Drill and practice is the simplest, most mundane type of microcomputer use and also the easiest type of program to create (for professional program designers and for teachers who write their own software). For social studies, most programs fall in this category, focusing on such topics as: capitals of states, geographical location of nations and continents, relational geography (e.g., Colorado is north of New Mexico and west of Kansas), capitals of nations, library research skills, and reading and summarizing tables of information presented in graphics.

Tutorials instruct the student in a sequence of question(computer)-response(student)-feedback(computer), in the well-known programmed instruction formats of linear or branching. Elementary social studies programs of this type are: how to read a map, how to handle money, how a bill becomes a law, colonies in the New World, and natural resources of _____ (a nation). This use is clearly almost as limiting as drill and practice.

Demonstration is a traditional teaching technique most commonly used in teaching science and mathematics. Using the microcomputer for demonstrations assures that the demonstration will work as planned and that all students can see what is happening--one or two at a time at the console. Further, this use often incorporates many special capabilities of the microcomputer like high-resolution graphics, multi-colored diagrams, sound effects, and moving figures. Although the computer is particularly well-suited to demonstrating such processes as planetary motion or fruitfly genetics, it can also be used to demonstrate system interactions in the social sciences like the circular flow diagram of a market economy, the evolution of geological strata (as in Grand Canyon), the time flow of underlying and immediate causes of an historical event, the public transportation systems of a large urban complex, and the dynamics of a social system (e.g., a family or an elementary school). One elementary social studies program ("Historic Scroll") prints up to 40 separate time lines of key events from B.C. to the present. Another ("You Can Bank on It") demonstrates how a bank operates as an interactive system. Demonstration programs for social studies are relatively rare.

Non-computer simulations have been popular with social studies teachers for the past fifteen years. Now they are available for the microcomputer, but with one somewhat severe limitation. Since social interaction (i.e., student-to-student and small group) is a valued aspect of in-class social

simulations, the machine-student interactions of microcomputer simulations tend to restrict if not preclude interaction among students.

Simulations model real-life or fantasy situations in simplified forms. They allow students to understand the essential factors involved and to change or manipulate key variables to yield diverse outcomes. Unlike games, simulations do not result in winners or losers; they tend to emphasize the process, the interaction of variables, and the effects of human decisions. There are quite a few commercially produced simulations for social studies, simulating such contexts as: an overland journey on the Oregon Trail in the nineteenth century; the fur trade in the 1770s; ruling the ancient kingdom of Sumer; transporting furs by canoe from Minnesota to Ontario, Canada; small business practices in selling apples, bicycles, or lemonade; problems faced by a forest fire dispatcher; and Presidential election campaigns.

Instructional games usually simulate a situation in which the goal is to beat an opponent--another student or the computer. Here also there are many programs available for social studies, but as is the case with simulations, there is considerable variation in quality and appropriate applicability. Topics of some instructional games are: getting from point A to B by the shortest and quickest route (map reading skills); solving a murder mystery (logic and problem-solving); and war games (Napolean/Wellington at Waterloo or North/South in Civil War).

Finally, teachers can use microcomputers to teach Computer Literacy skills. Becoming literate with computers generally means being able:

--to run commercially produced programs on a variety of subjects and topics;

--to program, that is, to create programs for personal, vocational, and academic applications;

--to modify or debug an existing program;

--to use computers to retrieve information, to make decisions, and to solve problems;

--to evaluate the usefulness of a program for a particular purpose; and

--to understand computer technology as a source of social issues (e.g., invasion of privacy).

Presently a few programs are available for microcomputers that teach various facets of Computer Literacy Skills such as: computer capabilities (e.g., word processing, graphics, sound effects); history of computers; writing programs in BASIC or LOGO; using the typewriter keyboard and special control keys; and how a computer works (including rudimentary electronics).

A Few More Answers. Some partial answers to the questions raised earlier--questions about microcomputers often asked by principals and teachers--can be found in the several boxes (appendices) accompanying this paper.

A Crucial Logistics Problem. It is not unusual to find 10, 20, 30, or even 50 microcomputers in an urban or suburban junior or senior high school. In elementary schools it's a different story. There the mode is one or two per school. Thus, in an elementary school a key problem is allocating principal, teacher, and student time at the console. And, for good or ill, social studies time on the microcomputer may be totally ignored.

Something To Think About

Currently there seems to be great optimism concerning the possible educational uses of microcomputers. The idealists are citing the possibility of creating intellectually stimulating environments for teaching all subject matter. They see as a goal the development of a generation of adults able to perform logical thought, to process vast amounts of information, and to perform analtyic tasks. Ideally, students may have at their fingertips the resources of highly complex, flexible information storage, retrieval, and processing--truly powerful resources.

As we examine the current situation in schools, we are aware that the present predominant use pattern of microcomputers is with a single individual at a time. We know there is currently precious little software (courseware) of sound educational value, especially in the social studies. Another reality is that the cost of microcomputers is high relative to other classroom learning materials. The degree to which the gap between the ideal and the real can be bridged certainly will set the direction in social studies and in other curriculum areas, for the next 20 years or more.

In the process of making changes, a number of issues arise. Will extensive use of microcomputers result in the decline of the development of student social interaction skills? This is a critical issue for social

studies educators. Will the computer age take away the level of curiosity of young people? Will microcomputer use result in further reductions in teaching staff? Like other innovations in education, will the rich districts become richer and the poor poorer? These issues, and others, are important to analyze and resolve.

Will our educational future be the age of new technology...the age of the computer...the age of information? Perhaps Asimov is correct when he says, "We are reaching the stage where the problems that we must solve are going to be unsolvable without computers. I do not fear computers. I fear the lack of them." (Isaac Asimov, Time, February 20, 1978).

APPENDIX 1

Some Microcomputers Used in Schools

--Apple II Plus and IIe

--Atari 800 and 1200

--Commodore 64, C128, and VIC20

--Compucolor II

--IBM Personal Computer (PC)

--Osborne I and Executive

--Texas Instrument T199/4A and T199-2

--Radio Shack TRS-80 and Model III

APPENDIX 2

Mini-Glossary of Microcomputer Terms

BIT: acronym for "binary digit"; a zero or a one; smallest unit of computer information

BUG: an error in a program; corrected by debugging

BYTE: a character of computer text, usually composed of 8 bits

CHIP: small, thin piece of silicon with a circuit printed on it

COMPUTER ASSISTED INSTRUCTION (CAI): any instructional application of computers such as drill, tutorial, demonstration, or simulation

CURSOR: The indicator (sometimes flashing) that is moved by commands of user

DOS: A "disk operating system," a set of programs on a diskette that manages the computer and its peripherals and allows programs to run and data to be processed

FIRMWARE: programs fixed in the computer by the manufacturer

HARDWARE: The physical equipment or devices which comprise a computer system (e.g., console, monitor, and disk drive)

LANGUAGES: specially created computer language systems such as BASIC, COBOL, FORTRAN, and LOGO

LANGUAGE COMMANDS: special words in a language reserved for causing the computer to execute a function (e.g., RUN, LOAD, SAVE, and CATALOG)

MEMORY: The integrated circuits of a computer where data and information are stored (e.g., ROM=Read-Only-Memory, and RAM=Random-Access-Memory); memory capacity is measured in thousands (K) of bytes such as 32K, 48K, or 64K

MICROPROCESSOR: an integrated circuit that executes instructions such as a Central Processing Unit (CPU); a microcomputer is a computer whose CPU is a microprocessor

PERIPHERALS: equipment designed to communicate with a CPU or to display CPU outputs such as a printer, a graphics board, or a disk drive; sometimes these devices are integral parts of the computer console

PROGRAM: a list of instructions to tell a computer what to do; may be from one to ten or more on a diskette; a lesson or unit of instruction; programs are written by programmers who do programming; programs are also called "software"

APPENDIX 3

Six Useful Books on Microcomputers in Education*

Becker, Henry J., Microcomputers in the Classroom: Dreams and Realities, Baltimore, MD: Center for Social Organization of Schools (Report No. 319), Johns Hopkins University, 1982 (booklet).

Coburn, Peter, et al., Practical Guide to Computers in Education, Reading, MA: Addison-Wesley Publishing Co., 1982 (paperback).

Papert, Seymour, Mind-Storms, New York, NY: Basic Books, Inc., 1980 (paperback).

Poirot, James L., Computers and Education, Austin, TX: Sterling Swift Publishing Co., 1980 (paperback).

Taylor, Robert P. (editor), The Computer in the School: Tutor, Tool, Tutee, New York, NY: Teachers College Press, Columbia University, 1980 (paperback).

VanDiver, Gerald and Rolland Love, The Educators Handbook for Microcomputers, Overland Park, KS: Vital Information Inc., 1982 (paperback).

*Also see NCSS How To Do It Series, Series 2, No. 14 (1981), Richard A. Diem, "Computers in the Social Studies Classroom."

APPENDIX 4

Sources of Information on Educational Microcomputer Software*

The Apple Software Directory (Vol. 3--Education)
WIDL Video
5245 West Diversey Ave.
Chicago, IL 60639

Courseware Magazine
4919 N. Millbrook, #222
Fresno, CA 93726

Huntington Computing Catalogue (free)
P.O. Box 1297
1945 S. Dairy
Corcoran, CA 93212

International Microcomputer Software Directory
Imprint Softwares
420 South Howes St.
Fort Collins, CO 80521

School Microware Directory
Dresden Associates
P.O. Box 246
Dresden, ME 04342

K-12 Micro Media (free)
172 Broadway
Woodcliff Lake, NJ 07675

Marck (free)
280 Linden Ave.
Brandon, CT 06405

MECC Catalogue (free)
2520 Broadway Dr.
St. Paul, MN 55113

Scholastic Microcomputer Instructional Materials (free)
904 Sylvan Ave.
Englewood Cliffs, NJ 07632

TRS-80 Software Directory
(available from local Radio Shack stores)

*By the end of 1983 virtually all major textbook publishers will feature a line of microcomputer software.

APPENDIX 5

Educational Computing Periodicals

ACM SIGCUE Bulletin
Association for Computing Machinery, Special Interest Group, Computer Uses in Education
P.O. Box 12015
Church Street Station
New York, NY 10249

Classroom Computer News
Intentional Educations, Inc.
51 Spring St.
Watertown, MA 02172

The Computing Teacher
Department of Computer and Information Science
University of Oregon
Eugene, OR 97403

Educational Computer Magazine
P.O. Box 535
Cupertino, CA 95015

Electronic Learning
Scholastic, Inc.
902 Sylvan Ave., Box 2001
Englewood Cliffs, NJ 07632

APPENDIX 6

General Computing Magazines

BYTE
70 Main St.
Peterborough, NH 03458

Creative Computing
P.O. Box 789-M
Morristown, NJ 07960

Personal Computing
P.O. Box 1408
Riverton, NJ 08077

Popular Computing
70 Main St.
Peterborough, NH 03458

InfoWorld
530 Lyttan
Palo Alto, CA 94301

Interface Age
16704 Marquardt Ave.
Cerritos, CA 90701

APPENDIX 7

A Checklist for Evaluating Programs for Microcomputers*

A. COVER PAGE AND INITIAL INFORMATION

_____1. Does the display include a "cover page" at the start of the program? (The "cover page" should include the name of the program, the version/edition, the author, source and date.)

_____2. If the program is a printed copy of the program (a "listing") does the program listing include the author's name, address, machine (name, model and additional information) for which the program is written, the langauge and version of the language in which it is written and the date?

B. INSTRUCTIONS

_____1. Are they given, or is the user told how to get them?

_____2. Can they be bypassed if desired, or are they short enough to be shown automatically?

_____3. Can the user return to the instructions during the program?

_____4. Are they worded for the program's user age group? (age, class, ability level, etc.)

_____5. Are they complete and clear?

C. INPUT

_____1. Is there an indicator to show where input will appear?

_____2. Does the user get hints when input errors are made?

_____3. Does the program respond to illegal inputs? Are resulting error messages easy to understand?

_____4. Does the program "bomb" if "bad" input is entered? e.g., entering an alphabetic character instead of a number, or just pressing RETURN.

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*This is a variation of a list from the COMPUTING TEACHER, May 1982, p. 48-49. Developed by SOFTSWAP, SMERC Library, San Mateo County Office of Education, 333 Main Street, Redwood City, CA 94063. Modified by Dr. Marc Swadener, School of Education, University of Colorado, Boulder, CO 80309.

C. INPUT (contd)

_____5. Does the input system allow for mistakes to be corrected by the user?

_____6. Is the exact format of INPUT specified?

D. OVERALL IMPRESSION

_____1. Is the format of the output neat? (no words running over the end of the line, lines double spaced where possible for younger users, screen not crowded, etc.)

_____2. When comments, instructions, etc. appear on the screen for a limited time, is that time long enough for the words to be read and understood? --OR-- Is advancing to the next "page" controlled by the user?

_____3. Does the program clear the screen before and after the "cover page" is displayed?

_____4. Does the program make use of motivational devices?

___*Timing
___*Scoring
___*Graphics
___*Effective personalization (informal, conversational, addressing the user by name, etc.)
___*Random reinforcement
___*Free of demeaning remarks
___*Minimal use of violence

_____5. Does the program have difficulty levels appropriate for this purpose?

_____6. When appropriate, is the correct response given after a reasonable time or after a given number of attempts?

_____7. Does the program allow starting over easily?

_____8. Is there a standardized instruction to continue (e.g., "hit the space bar to continue") at the bottom of the page?

_____9. Is the program accurate?

*Spelling, punctuation, grammar, etc.
*Is the content accurate?

___ 10. Is it easy to end the program? Is this done neatly (screen clean)?

D. OVERALL IMPRESSION (contd)

____11. Is the program free of stereotypes (sex, race, etc.)?

____12. Is the program free of inappropriate language?

See also Evaluator's Guide for Microcomputer-Based Instructional Packages, Northwest Regional Educational Laboratory, Portland, Oregon. 1981.

APPENDIX 8

Interview with Gary Steward, K-12 Computer Education Coordinator, Weld County School District 6, Greeley, Colorado

Q. How did you and your staff become interested in microcomputers and how is this interest maintained?

A. We can't ignore the publicity in educational journals and media advertisement the past two to three years. Also, the impact many of our students having acquired their own computers at home can't be overlooked.

In January 1981 there was a district task force that wrote a position paper on technology. In fact, the district superintendent was the task force chairman. Also, at that time, 30 district personnel had just finished the first session of a computer literacy course at the University of Northern Colorado. Those 30 people spread the word throughout the district and the desire to become involved spread like wildfire. However, in a school, there must be a person knowledgeable about microcomputers and their application--a "spark plug" who can assist, encourage, and troubleshoot to maintain that interest.

Q. What specifically is happening at the elementary level?

A. At the elementary level we are striving toward computer literacy for students in our PEAK program. It's a gifted and talented program. We're working directly with the PEAK teachers in giving them computer literacy--actual programming using a specific language they will share with their students. In addition to the PEAK teachers, we have microcomputers in elementary schools and teachers are beginning to use them with all students. In these schools we are not teaching the BASIC programming language. We are using commercial programs.

Q. What's the most common pattern of use of microcomputer use in your elementary schools?

A. The most common pattern is small group with teachers working with 10-15 students at one time with one microcomputer. They use it as a demonstration device, using mainly simulation programs with kids taking turns doing parts of a program. The next most frequent use would be with an entire class. The computer is set up right now on a cart for movement, so it can be moved from room to room.

Q. What is being done with social studies?

A. Mostly simulations. We do very little drill and practice, mainly because it's very difficult to cue elementary kids on the computer.

Q. What's your view on how computers ought to be used in schools?

A. Primarily, we would like to see the in-classroom use, because the teacher is in control of the situation. If we use one central location, the teacher has to relinquish the children. The other person may not know exactly what the teacher wanted to accomplish.

Q. In your experience, what is an ideal computer-student ratio for in-classroom use?

A. One computer per 15 students.

Q. If you were to give advice to teacher educators regarding teacher training and microcomputers, what would you tell them?

A. Spend time helping trainees use the microcomputers in the classroom, especially keyboard operation and use of existing software. Too frequently I see inservice and preservice training on programming itself. This is frustrating for all. Exposure to published programs and using those programs gives the teacher confidence in being able to deal with the microcomputer in the classroom. That's really what we need more of.

Q. If you were to give recommendations to software producers, what would you say about materials they should develop?

A. They must spend more time in producing simulations and demonstrations. These are programs that teachers do not need to develop themselves. I am sorry to say that most of the software is drill and practice. In my opinion, this is not good use of the technology. Using the technology available to enhance a specific concept in the initial stages of learning is a better use of technology.

Educators should choose software to fit district curriculum objectives. We do not want to change our objectives and programs to fit the technology and available software. Software producers must find out about school district objectives and produce materials to fill them.